Integrated Pest Management in Residential Landscapes

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Tree and Landscaping Seminar
City of Annapolis
April 2, 2011

Objectives

- What is IPM?
- Landscape ecology and pest management
- Information resources

Components of an IPM Program

1. Develop an IPM policy
2. Designate pest management roles
3. Establish IPM objectives
4. Develop a knowledge base
5. Develop and implement a monitoring protocol
6. Decision-making guidelines
7. Control tactics / management strategies
8. Evaluation

IPM Policy

- Document that demonstrates the commitment of the company / organization
  - Will vary with managed system (ex. public gardens, production nursery, homeowner association)
  - Demonstrates or clarifies administrators / owners are supporting the IPM program
- Provides a guide for development of the IPM program
  - What areas are under IPM; what types of chemicals / control tactics can or can not be used; notification, who will be involved; what are the expectations or goals

Designate Pest Management Roles

- Identify roles of staff relating to pest management
  - Pest manager (ex. scouting, recommendations)
  - Administrators (decision making)
  - General staff (implementation, record keeping)
- Develop communication mechanisms
- Educate and train staff relating to their roles

Establish IPM Objectives

- Will vary from site to site, over time
  - Greens vs fairways vs roughs
  - Level a, level b, level c athletic fields
  - Home community entry way vs green space
- Identify needs of clientele or management
- Be realistic

Develop a Knowledge Base

Determine Site History

- Previous plantings
- Previous problems / treatments
- Previous cultural practices
- Environmental conditions
- Site conditions

Develop a Knowledge Base

Develop a Plant Inventory

- A list or map (GPS) of all plants and structures on property
- Identify key plants, locations, pests

Why Monitor?

- Identify pests, plant damage, and beneficials
- Pinpoint insects in time and space
- Time controls for maximum effectiveness
- Minimize adverse effects on beneficial organisms

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IPM Control Tactics

Cultural or sanitation practices

Mechanical or physical controls

Biological controls

Chemical controls

Pests outbreak more frequently in managed than natural ecosystems

Goal

- **Create and maintain sustainable urban landscapes**

www.californiagreensolutions.com

Urban Landscapes

- Unique features and properties relative to natural and other managed systems
- Features include contrived plant communities resulting from:
  - widespread use of exotic plants, relative to natives
  - impervious surfaces (ex. hardscapes)
  - simplified designs (vegetation diversity and complexity)
  - common maintenance practices such as inputs of fertilizers, water, and pesticides

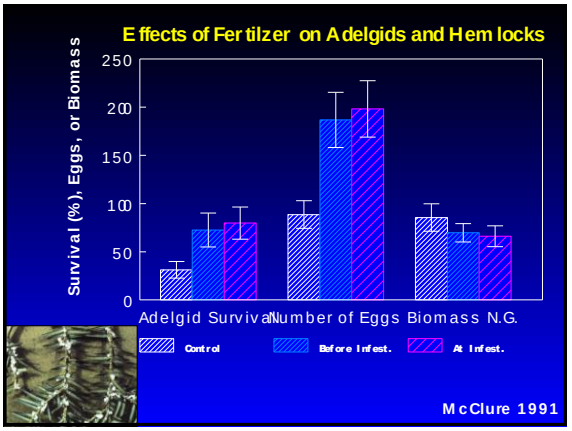
- Properties of urban landscapes create opportunities for insects and mites to increase. These include changes in:
  - host plant quality and accessibility (bottom-up factors)
  - natural enemy abundance and diversity (top-down factors)
  - microhabitats including creation of heat islands
  - matrixes that disrupt movement and colonization of herbivores and natural enemies

Raupp, Shrewsbury, & Herms. 2010. *Ecology of herbivorous arthropods in urban landscapes*. Annual Review of Entomology. 55: 19-38.

Euonymus scale on Euonymus

Hawthorn lace bug on cotoneaster

Banded Ash Clearwing Borer



Brown marmorated stinkbug

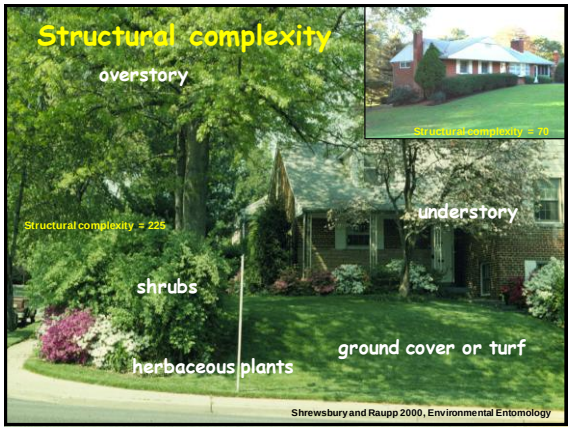
Goal

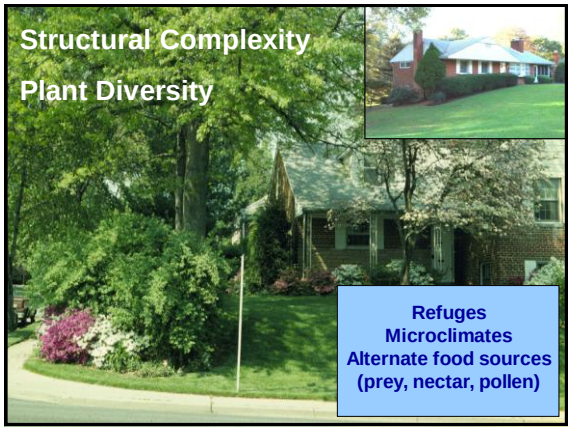
- Create and maintain <u>sustainable</u> urban ecosystems
- Avoid practices that favor herbivores
- Restore natural enemy – herbivoredynamics and the ecosystem service of biological control

Landscape biodiversity is important!

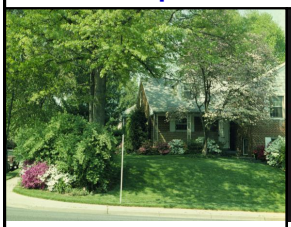
Plant Diversity can be estimated different ways

- **Species richness** – number of plant species
- **Structural complexity** – vegetation found in a three dimensional space





Habitat Complexity

Complex	Simple
	

Habitat Complexity

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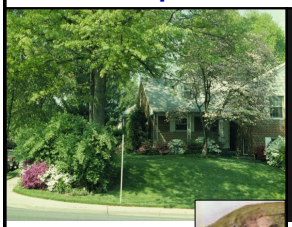
	
	
Lace Bugs Natural Enemies Alternative Prey	Lace Bugs Natural Enemies Alternative Prey

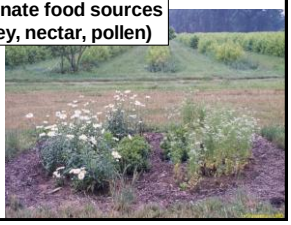
Is it possible to design or create landscapes with increased diversity (complexity and richness) and reduce pest abundance?

Refuges
Microclimates
Alternate food sources
(prey, nectar, pollen)

Add flowers

to

landscapes



Shrewsbury et al. 2004, IJEES

Shasta Daisy

- Warm season bloomer
- Large floral architecture

Coriander

- Cool season bloomer
- Small floral architecture

Conclusions:

Azaleas plots with flowers have:

- greater abundance of alternative prey
- greater abundance of natural enemies
- lower survival of azalea lace bug

Conservation strips in Golf Courses

Frank and Shrewsbury 2004, Environmental Entomology

Enhance Beneficials by Providing Nectar and Pollen Sources

- Carrot family (Umberlliferae)
  - caraway, dill, fennel, coriander, parsley
- Mint family (Labiatae)
  - catnip, hyssop, lemon balm
- Rosemary, thyme, other her
- Daisy family (Compositae)
  - coneflower, daisies, yarrow
- Cover crops – use as garden borders
  - alfalfa, buckwheat, clover

- From: Organic Gardeners Handbook of Natural Insect and Disease Control. 1992. Rodale Press, Emmaus, PA.

Others: Sweet alyssum, phacelia, sunflower

Publication: *Farmscaping to Enhance Biological Control*

http://www.attra.ncat.org/attra-pub/pdf/farmscaping.pdf

Google: attra

Shrubs & Trees

(Permanent habitat, tree layers)

Blackberry (*Rubus*)
Red maple (*Acer rubrum*)
Dogwood (*Cornus*)
Raspberry (*Rubus*)
Fruit trees (apple, cherry, plum)
Sumac (*Rhus*)
Juneberry (*Amalanchier*)
Willows (*Salix*)

Amalanchier

Black cherry

http://www.attra.org/attra-pub/pdf/farmscaping.pdf

Flowers & Herbs

Alfalfa (*Medicago sativa*)
Goldenrod (*Solidago*)
Alsike clover (*Trifolium hybridum*)
Goldfields (*Lasthenia chrysostoma*)
Asters (*Aster*)
Hollyhock (*Alcea rosea*) (single varieties)
Beard tongue (*Penstemon*)
Impatiens (*Impatiens*)
Bee balm (*Monarda*)
Milkvetch (*Astragalus*)
Birds-foot trefoil (*Lotus corniculatus*)
Milkweed (*Asclepias*)
Borage (*Borago officianalis*)
Mints (*Mentha, Salvia*)
Buttercup (*Ranunculus*)
Marjoram (*Origanum*)
Calendula (*Calendula*) (single varieties)
Nasturtiums (*Tropaeolum*)

http://www.attra.org/attra-pub/pdf/farmscaping.pdf

Flowers & Herbs

Coneflower (*Echinacea*)
Oilseed rape (*Brassica napus*)
Chrysanthemum (*Dendranthema*)
Pincushion (*Chaenactis*)
Crown-beard (*Verbesina*)
Red clover (*Trifolium pratense*)
Daisies Scorpion weed (*Phacelia*)
Dandelion (*Taraxacum officinale*)
Sunflowers (*Helianthus*)
Evening primrose (*Oenothera*)
Tickseed (*Coreopsis*)
Forget-me-not (*Myosotis*)
Wild mustard (*Brassica*)
Fuchsia (*Fuchsia*)
Vervain (*Verbena*)
Gilia (*Gilia*)
Wild buckwheat (*Eriogonum*)
Globe mallow (*Sphaeralcea*)

http://www.attra.org/attra-pub/pdf/farmscaping.pdf

MD Native plant species tested to determine their attractiveness to natural enemies

Common name	Scientific name	Family
Common milkweed	*Asclepias syriaca*	Asclepiadaceae
Butterfly weed	*Asclepias turberosa*	Asclepiadaceae
Threadleaf coreopsis	*Coreopsis verticillata*	Asteraceae *
Hyssopleaf thoroughwort	*Eupatorium hyssopifolium*	Asteraceae *
Spotted horsemint	*Monarda punctata*	Lamiaceae *
Narrowleaf mountain mint	*Pycnanthemum tenuifolium*	Lamiaceae *
Skullcap	*Scutelaria integrifolia*	Lamiaceae
Switchgrass	*Panicum virgatum*	Poaceae
Indiangrass	*Sorghastrum nutans*	Poaceae
Little bluestem	*Schizachyrium scoparium*	Poaceae

Frank, Shrewsbury, & Esiekpe, 2008 Environmental Entomology (37:2)

MD Native Beneficial Insectary Plants

Coreopsis verticillata

Pycnanthemum tenuifolium

Eupatorium hyssopifolium

Monarda punctata

Frank, Shrewsbury, & Esiekpe, 2008 Environmental Entomology (37:2)

MI Native Beneficial Insectary Plants

Eupatorium perfoliatum L.

Monarda punctata L.

Silphium perfoliatum L.

Potentilla fruticosa auct. non L.

Coreopsis lanceolata L.

Spiraea alba Duroi

Agastache nepetoides (L.) Kuntze

Anemone canadensis L.

Angelica atropurpurea L.

Cup plant
Silphium perfoliatum L.

Canada anemone
Anemone canadensis L.

http://nativeplants.msu.edu

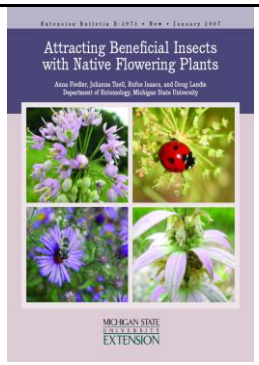
MI Native Beneficial Insectary Plants

Shrubby cinquefoil
Potentilla fruticosa auct. non L.

Meadowsweet
Spiraea alba Du Roi

Yellow giant hyssop
Agastache nepetoides (L.) Kuntze

Angelica
Angelica atropurpurea L.



http://nativeplants.msu.edu/pdf/E2973.pdf

Habitat Manipulation - Recommendations:

- Increase structural complexity
  - More plants at different vegetational strata, especially tree and ground cover layers
- Increase biodiversity
  - More plant species, families
- Add flowers
  - vary architectural complexity
  - provide season long bloom

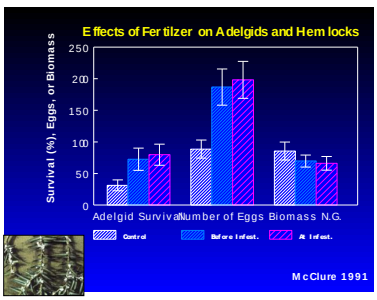
- Select plants based on proven attractiveness and natural enemies they attract
- To provide:
  - a community of plant species that attracts diverse natural enemy taxa and provides habitat and nectar and pollen throughout the season

Avoid activities that are harmful to natural enemies

- Choose pesticides wisely!
  - Low toxicity, selective, short residual activity, IGR
  - EPA Reduced Risk Pesticides
- Integrate alternative control measures
  - Cultural, mechanical, or biological tactics

Avoid high nitrogen, quick release fertilizers

Spider mites, aphids, adelgids, root weevils, caterpillars

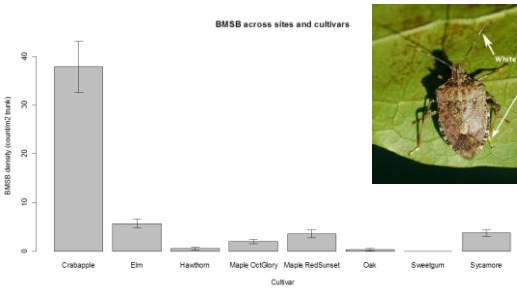


Prune out tents / caterpillars of fall webworm

Commercially Available Nematodes

Nematode	Insect (major markets)
S. carpocasae	Caterpillars (turf, clearwings)
S. glaseri	White grubs (turf)
S. riobravis	Mole crickets (turf), Citrus weevils (citrus)
S. scapterisci	Mole crickets (turf)
S. feltiae	Fungus gnats (ornamentals, mushrooms)
H. bacteriophora	White grubs (turf), root weevils (ornamentals, citrus, berries)
H. megidis	

Management – resistant plants



Develop BMSB resistant landscapes, reduce overwintering populations in structures

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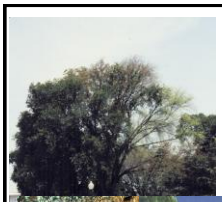
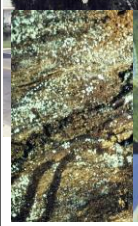


American Elms – Low diversity in a "managed system"

Suitable Host – American Elm

Pathogen –DED, *Ophiostoma ulmi*

Vector – Smaller European Elm Bark Beetle



40 Million Elm Trees Killed by DED Since 1930

What lesson did we learn from DED?

Exotic Pests…

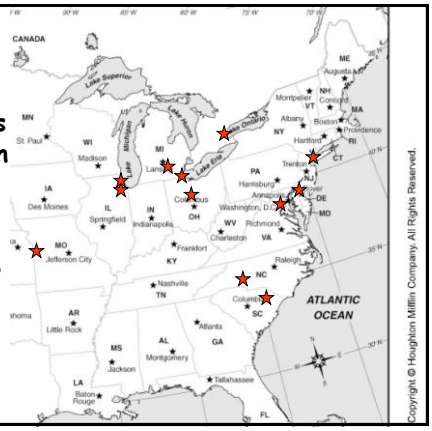
Asian long-horned beetle

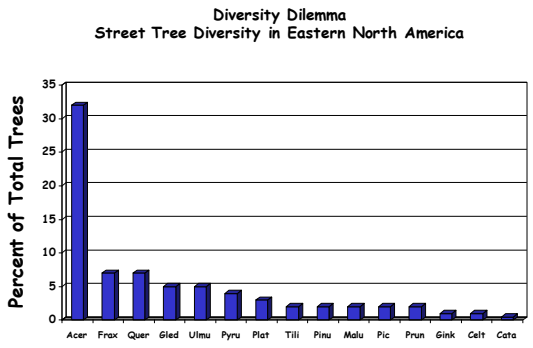
Emerald Ash Borer

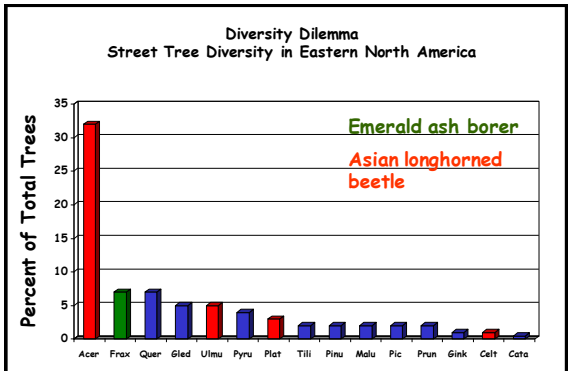
Asian Longhorned Beetle Hosts:
Acer, Aesculus, Albizzia, Alnus, Betula, Elaeagnus, Fraxinus, Hibiscus, Malus, Platanus, Populus, Prunus, Pyrus, Robinia, Salix, Sophora, Tilia, and Ulmus

Emerald Ash Borer Hosts:
***Fraxinus* (ash)**
Ulmus, Juglans, Pterocarya (not in U.S.)

How diverse is the urban forest in eastern North America?







How Will EAB Impact Maryland?

- Ash is the most common tree in Baltimore
  293,000 trees, 10.4% of trees total population
- Ash accounts for 5,982,000 - 6,591,000 trees in the Baltimore– metro area
- Ash trees are not the most important or prevalent trees in the Baltimore-Washington corridor - they account for > 5% of saplings and 5% of trees

Galvin citing DNR,MDA, and USDA sources 2003

Conclusions

- Cities face the loss or need for insecticide protection of 29% to 70% of their street trees
- The average percentage of trees at risk was 49.7% (4.0% s.e.)
- No more Acer or Fraxinus
- Diversify now or face catastrophic loss

Raupp et al. 2006

Replanting Strategies

- Resistant species
- Diverse plantings

RUTGERS COOPERATIVE EXTENSION

Asian Long-horned Beetle

New Jersey Update - Replacements

Apple / Crabapple	Buckthorn	Catalpa
Cherry / Plum	Cottonwood	Flowering Dogwood
Pagoda Dogwood	Turkish Filbert	Ginkgo
Hawthorn	Honeylocust	Linden / Basswood
Black Locust	White Mulberry	Magnolia
Oaks	Pear	Redbud
Tulip Tree	Black Walnut	

Building on the Past – Providing Solutions for the Future

RUTGERS COOPERATIVE EXTENSION

Trees recommended by the New Jersey Forest Service for Planting in and around ALB sites

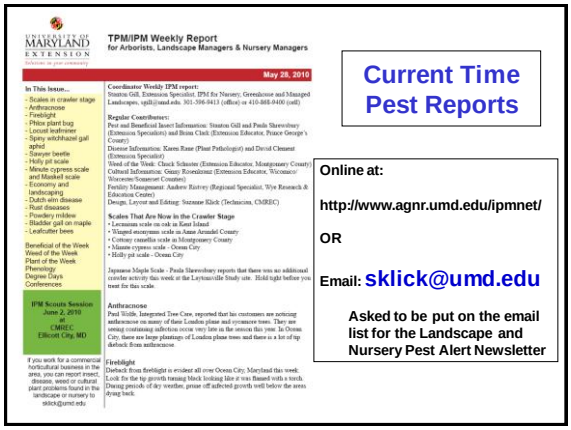
American Arborvitae cultivars (*Thuja occidentalis*)
American Hophornbeam (*Ostrya virginiana*)
American Sweetgum (*Liquidambar styraciflua*)
American Yellowwood (*Cladrastis kentukea*)
Amur Corktree (*Phelllodendron amurense*)
Baldcypress (*Taxodium distichum*)
Beech (*Fagus spp.*)
Blackgum/Tupelo *(Nyssa sylvatica*)
Callery Pear (*Pyrus calleryana*)
Carolina Silverbell (*Halesia tetraptera*)
Chinese Juniper cultivars (*Juniperus chinensis*),
Crabapple (*Malus spp.*)
Dawn Redwood (*Metasequoia glyptostroboides*)
Dogwood (*Cornus kousa*)
Eastern Redbud (*Cercis canadensis*)
Eastern Redcedar cultivars (*Juniperus virginiana*)
European Hornbeam (*Carpinus betulus*)
Flowering Dogwood (*Cornus florida*)
Ginkgo (*Ginkgo biloba*)
Goldenraintree (*Koelreuteria paniculata*)
Gray Dogwood, (*Cornus racemosa*)

Hawthorn (*Crataegus spp.*)
Honeylocust (*Gleditsia triacanthos*)
Japanese Tree Lilac (*Syringa reticulata*)
Japanese Zelkova (*Zelkova serrata)*
Katsuratree (*Cercidiphyllum japonicum*)
Kentucky Coffeetree (*Gymnocladus dioicus*)
Kousa Dogwood (*Cornus kousa*)
Leyland Cypress (x *Cupressocyparis leylandii)*
Littleleaf Linden (*Tilia cordata*)
Magnolia (*Magnolia spp.*)
Mountain Silverbell (*Halesia monticola*)
Oak (*Quercus spp.*)
Ornamental Cherry (*Prunus spp.*)
Serbian Spruce (*Picea omorika*)
Serviceberry (*Amelanchier spp*)
Silver Linden (*Tilia tomentosa*
Stewartia (*Stewartia spp.*)
Swiss Stone Pine (*Pinus cembra*)
Tulip Tree(*Liriodendron tulipifera*)
Turkish Filbert (*Corylus colurna*)
Upright White Pine (*Pinus strobus* Fastigiata)
White Fringetree (*Chionanthus virginicus*)

Resources for IPM

- Text books
- University Extension Service
  - publications (bulletins and fact sheets)
  - web sites
  - electronic newsletters
  - diagnostic clinic, Dept. of Entomology, UMCP
- Web
  - images of pests, plant damage and beneficials
  - Extension information

- Pest Monitoring Time table (what pests are active by month)
- Guide to Insect and Mites by Preferred Host Plants (list of woody plants with the insects and mites that attack them)
- Biology, monitoring, symptoms, timing, management
- Order from: TCIA.org



TPM/IPM Weekly Report
for Arborists, Landscape Managers & Nursery Managers

May 28, 2010

In This Issue...
- Scales in crawler stage
- Anthracnose
- Fireblight
- Phlox plant bug
- Locust leafminer
- Spiny witchhazel gall aphid
- Sawyer beetle
- Holly pit scale
- Minute cypress scale and Maskell scale
- Economy and landscaping
- Dutch elm disease
- Rust diseases
- Powdery mildew
- Bladder gall on maple
- Leafcutter bees

Beneficial of the Week
Weed of the Week
Plant of the Week
Phenology
Degree Days
Conferences

IPM Scouts Session
June 2, 2010
at
CMREC
Ellicott City, MD

If you work for a commercial horticultural business in the area, you can report insect, disease, weed or cultural plant problems found in the landscape or nursery to sklick@umd.edu

Coordinator Weekly IPM report:
Stratton Gill, Extension Specialist, IPM for Nursery, Greenhouse and Managed Landscapes, sgill@umd.edu, 301-596-9413 (office) or 410-868-0400 (cell)

Regular Contributors:
Pest and Beneficial Insect Information: Stratton Gill and Paula Shrewsbury (Extension Specialists) and Beina Clark (Extension Educator, Prince George's County)

Disease Information: Karen Rane (Plant Pathologist) and David Clement (Extension Specialist)

Weed of the Week: Chuck Schuster (Extension Educator, Montgomery County)

Cultural Information: Ginny Rivenbburg (Extension Educator, Wicomico/Worcester/Somerset Counties)

Fertility Management: Andrew Ristvey (Regional Specialist, Wye Research & Education Center)

Design, Layout and Editing: Suzanne Klick (Technician, CMREC)

Scales That Are Now in the Crawler Stage
- Lecanium scale on oak in Kent Island
- Winged euonymus scale in Anne Arundel County
- Cottony camellia scale in Montgomery County
- Minute cypress scale - Ocean City
- Holly pit scale - Ocean City

Japanese Maple Scale - Paula Shrewsbury reports that there was no additional crawler activity this week at the Laytonsville Study site. Hold tight before you treat for this scale.

Anthracnose
Paul Wolfe, Integrated Tree Care, reported that his customers are noticing anthracnose on many of their London plane and sycamore trees. They are seeing continuing infection occur very late in the season this year. In Ocean City, there are large plantings of London plane trees and there is a lot of tip dieback from anthracnose.

Fireblight
Dieback from fireblight is evident all over Ocean City, Maryland this week. Look for the tip growth turning black looking like it was flamed with a torch. During periods of dry weather, prune off infected growth well below the areas dying back.

Current Time Pest Reports

Online at:

http://www.agnr.umd.edu/ipmnet/

OR

Email: sklick@umd.edu

Asked to be put on the email list for the Landscape and Nursery Pest Alert Newsletter

Google: Bug of the Week

http://www.raupplab.umd.edu/

Mike Raupp, Department of Entomology, UMD

Home and Garden Information Center

Ask the Experts!

- Website: hgic.umd.edu
- Hotline: 800-342-2507
- Twitter: UMDHGIC
- Facebook: Home and Garden Information Center

Home and Garden Information Center

Information Available

- Timely Tips
- Publications
- Plant Diagnostic Keys
- Master Gardener
- Links
- Invasive Species (Pest Threats Series)
- Send a Question – FAQ
- What's New

Master Gardeners

The Maryland Master Gardener Program was started in 1978 as a means of extending the horticultural and pest management expertise of University of Maryland Extension to the general public.

Anne Arundel Master Gardeners

- The Anne Arundel County Master Gardener Program is now accepting applications for the Fall 2011 training program. Applications must be received by August 1, 2011
- Anne Arundel training dates: Tues. and Thurs. Sept.15 - Nov. 3, 2011; Glen Burnie
- After completing 40 hours of training provided by Maryland Cooperative Extension professionals and 40 volunteer hours, participants earn the title of Master Gardener
- Contact Anne Arundel Master Gardeners program to find out the requirements and procedures for becoming a Master Gardener and taking Basic Training

Anne Arundel Master Gardeners

Anne Arundel Co. Extension

A.A. Co. Gov't. Office Bldg. #210
7320 Ritchie Highway Glen Burnie, MD 21061

Telephone: (410) 222-6757
Fax: 410-222-6747
M.G. Coordinator: Mike Ensor
E-mail: mensor@umd.edu

Web site:
http://www.agnr.umd.edu/Extension/local/AnneArundel/MasterGardeners/index.cfm